THE EARTH'S DAUGHTER

Hawaii's Volcanoes Show That Moon Once Occupied Present Bed of Pacific Ocean

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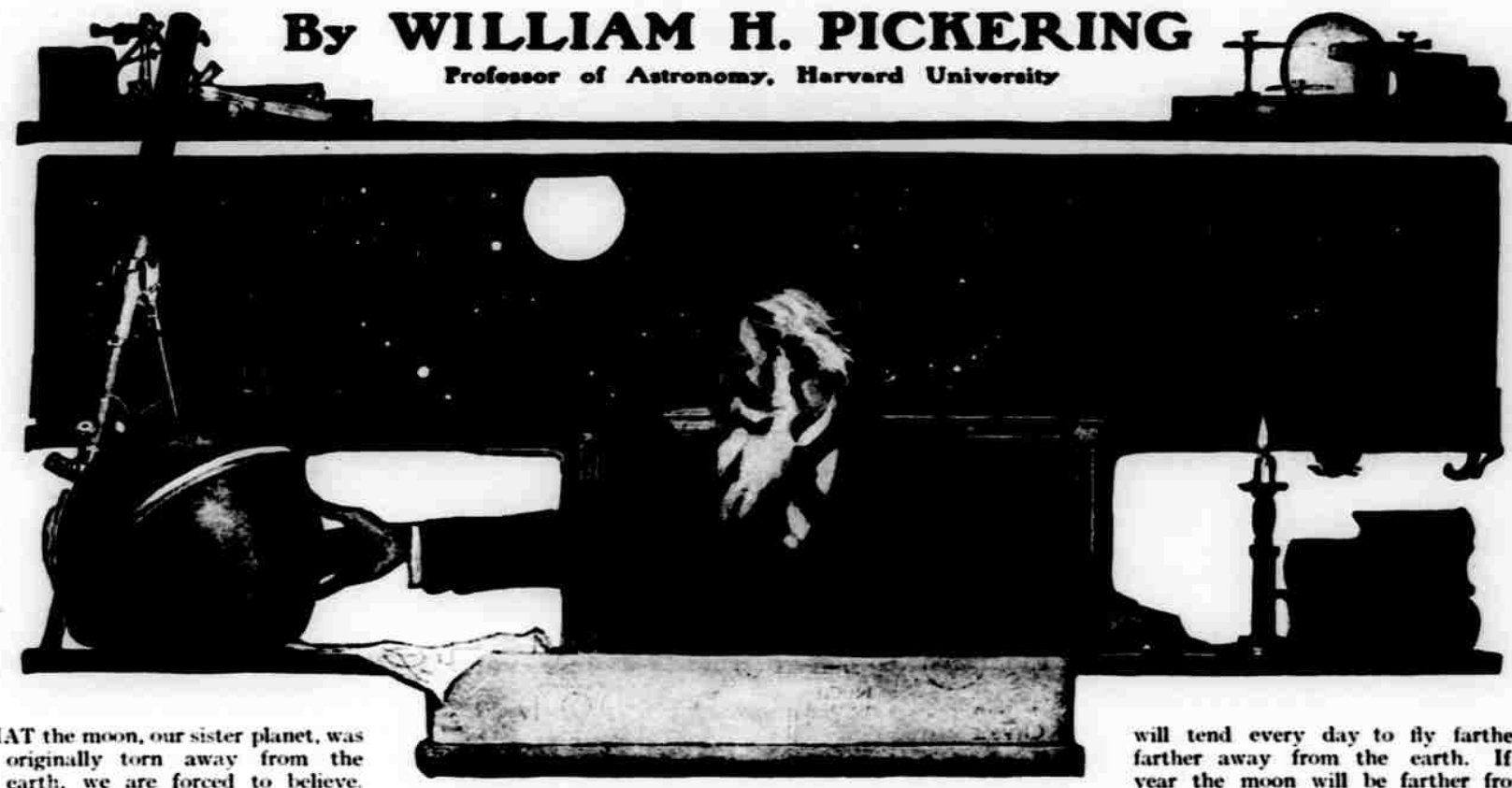

THAT the moon, our sister planet, was originally torn away from the earth, we are forced to believe. The period of its birth we locate somewhere between fifty million and five hundred million years ago. But there are many facts connected with this great change which still lie in the realm of speculation and theory, and some of them were brought home to me last summer, while I was studying the Hawaiian volcanoes, with an emphasis which seems worthy of a special note.

In the Hawaiian Islands rise perhaps the finest group of volcanic peaks upon our globe. Enormous in their height and tremendous in their activity, they differ from other volcanoes in many respects which lend them special importance in the study of the moon's origin. In the Island of Hawaii I found, lying black and sterile amid the magnificent growth of palms, bananas and tropical foliage, the great black lava-bed which swept down from Mauna Loa in 1880. It burst forth from the side of the mountain at a height of eleven thousand feet above the sea and a distance of seven miles from the nearest wall of the summit crater. It continued to flow for nine months, making straight for the town of Hilo, thirty-one miles away.

As an interesting commentary upon original belief and educated faith, the action of the natives may be noted. In great terror as the molten flow steadily approached their homes, they met constantly in their churches and prayed fervently that the flow might be arrested. Christianity had gained a firm hold among them fifty years before, and they trusted to it in their prayers; but finally the great burning flood continuing to advance unchecked, they lost heart and reverted to Paganism. They flocked en masse to Princess Ruth, one of the few survivors of the old line of native chiefs, and implored her to offer a sacrifice to Pele, the dread goddess of the volcano.

Ruth promptly came to the rescue, and without omitting a single one of the ancient sacred and traditional forms she solemnly sacrificed a pig, a white rooster and a bottle of wine, vintage not stated, by throwing them into the on-moving lava, whereupon the on-moving lava stopped instantly a mile outside the town. That it stopped on the date given is certain, and the Christian propaganda at Hilo since that day has been attended with some difficulty. Skeptical science, however, has hitherto declined to recognize any definite relation between volcanic action and a pig, a white rooster or even a bottle of wine.

The crater of Kilauea is the largest active crater in the world. It measures three miles by two, and near the center is located a pit known as Halemaumau, twelve hundred feet in diameter, with nearly vertical walls, and five hundred feet deep. This pit is gradually filling up with melted lava from below, and whenever this lava reaches the rim and begins to overflow the phenomena exhibited are said to be grand beyond description. It was last full to the brim in 1892; but on this occasion, contrary to rule, it emptied itself through some subterranean channel in a single night. Since then the crater has shown little activity, though red-hot lava-flows from thirty to fifty feet in length are sometimes seen at night at the bottom of the pit.

However, before proceeding to consider the new evidence offered by Kilauea and its attendant volcanoes—evidence new to me at least—let us briefly review our existing knowledge concerning the moon's origin. In order to understand it, we must first consider the mutual influences that the earth and moon exert upon each other at the present time. We all know that the moon creates a double tide upon the earth. If there were no continents to interfere, and if the ocean was deep enough, one of these tides would be always on the side of the earth toward the moon, and the other tide on the opposite side. There are two tides, because in one case the water nearest the moon is pulled away from the center of the earth, and in the other case the center of the earth is pulled away from the water that is still farther from the moon. This pulling force of the moon acts on the continents that are on opposite sides of the earth as well as on the oceans, but the continents being solid cannot yield and so move all in one piece, and only the oceans show the effect of the pull.

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As the result of the tides and the earth's rotation, large bodies of water are being constantly moved about over the earth's surface. We may indeed consider the earth as a wheel steadily revolving between two friction brakes, much as a grindstone might do. The result of this action is that the speed of the earth's rotation is constantly diminishing, every day being a little longer than its predecessor. That this may not occasion alarm among those who work by the hour, I hasten to add that the total lengthening of the day that has taken place since the beginning of the Christian era amounts to only a small fraction of a second. But this was not always so. In the early days, before the oceans appeared, and when a large part of the solid earth was molten matter, tremendous tides occurred in this mass of liquid rock, tides which were much more efficient in this respect than those now in existence.

But if the earth's rotation is being constantly held back by this action of the moon, since action and reaction are equal and opposite, the moon must constantly be pulled forward in its orbit by the earth. If the moon's velocity is accelerated, its centrifugal force will be increased, and as a result it will tend every day to fly farther and farther away from the earth. If next year the moon will be farther from the earth than it is to-day, then this year it must have been farther than it was the year before, and since the action is obviously continuous, in early times it is certain not only that the earth revolved faster on its axis, but also that the moon revolved nearer to the earth's surface.

In those early days, since the moon was nearer, the tides must have been higher, and therefore more effective, so that these actions must have been still more pronounced than they are at present. Carrying the process back therefore to its beginning, we come to a time when the moon must have laid close to the earth's surface, and when the earth must have revolved exceedingly fast.

It has been shown by Professor George H. Darwin, son of the eminent naturalist, that at the time when the moon nearly touched the earth's surface the earth must have revolved on its axis once in about three hours, instead of once in twenty-four. Now it can readily be shown that if the earth was to revolve on its axis in a little less than three hours portions of its surface near the equator would be likely to fly away by centrifugal force.

As the original cloudlets from which the earth was formed coalesced and revolved about the sun, they rotated upon their common axis, and as they condensed they must necessarily have rotated more and more rapidly. This rotation was doubtless somewhat diminished by the action of the tides produced in them by the sun, but as we have seen at a much later time, when the moon was near the earth they were revolving in about three hours. The presence of the moon must have already produced a retarding action, so that a little earlier, before the moon appeared, they must have been revolving still faster.

But this high speed could have been attained in only a comparatively small body, a body, that is to say, little larger than the earth is at present. As its speed of rotation increased, its centrifugal force must have increased also, consequently objects near its equator must have become lighter and lighter, and the solar tides must have risen higher and higher. Thus action went on, gradually becoming more and more critical, until one day a catastrophe occurred, a catastrophe of such magnitude as has never been seen upon the earth before or since—five thousand million cubic miles of material left the earth's surface never again to return to it. Whether it all left at once or the action was prolonged we do not know, but we may try in vain to imagine the awful uproar and fearful volcanic phenomena exhibited when a planet was cleft in twain and a new planet was born into the solar system. This was the moon's origin.

As to how long ago this separation occurred we are entirely in the dark, but we know that as astro-